REMARKS

The application has been carefully reviewed in light of the Office Action mailed December 29, 2006. At the time of the Office Action, Claims 1-30 were pending in this application. Claims 14, 16, 20, 22, 28 and 30 were objected to, and Claims 1-30 were rejected.

Objections to the Claims

Claims 14, 16, 20, 22, 28 and 30 have been objected to because of informalities. These claims have been amended as helpfully suggested by the Examiner.

Rejection of the Claims Under 35 U.S.C. § 103(a)

Claims 1-11, 14-18, 23 and 25-27 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Grindahl et al. (U.S. Pat. No. 4,786,903) in view of Alley et al. (U.S. Pat. No. 6,487,264).

Applicants respectfully traverse the rejections and submit that the references relied upon do not teach or suggest, individually or in combination, what is being claimed in independent Claims 1 and 23, and all claims dependent thereto.

The present invention is directed to a super-regenerative receiver comprising an oscillator and resonant tank circuit (*e.g.*, magnetic inductive coil and capacitor(s)). The oscillations of the super-regenerative receiver are quenched by loading the inductive coil of the resonant tank circuit so as to stop the oscillations in a decaying manner. The resonant tank circuit is thereafter released (quality factor (Q) unloaded) to allow the oscillations to begin again. The startup time for the oscillations may be inversely proportional to the received signal strength. The oscillator tank circuit may be used as a signal pickup coil (antenna). The resonant tank circuit coil may be loaded with a resistor connected in series with a transistor switch. One terminal of the transistor switch may be connected to a radio frequency ground and the other terminal connected to one end of the loading resistor. Thus, the transistor switch may be

controlled without requiring expensive opto-electric or radio frequency isolation. A signal detection circuit is coupled to the output of the super-regenerative receiver oscillator and may have detected signal information as a function of frequency or as serial digital information. A radio frequency amplifier may be used between a receiving antenna coil and the super-regenerative oscillator circuit for reducing radiated oscillations and noise. A digital processor may also control a tuning network coupled to the oscillator tank circuit so as to improve the reception sensitivity of super-regenerative receiver.

The quenchable oscillator of the present invention uses fixed biasing on the oscillator circuit that results in a constant and consistently high quality factor (Q) tank circuit after the quench is removed, thus the super-regenerative receiver, according to the present invention, has much better noise performance for the reception of both weak and strong signals. In addition, the super-regenerative receiver, of the present invention maintains a substantially linear quality factor (Q) of the tank circuit with widely varying signal strengths. Thus the super-regenerative receiver of the present invention has a much wider dynamic range with better minimum sensitivity because the quality factor (Q) of the tank circuit and thus bandwidth is maintained for very weak signals. Bias control design is also simplified because large signal response may be used to predict small signal response. By measuring the rise time from, for example, a 10 mV tank voltage to a 20 mV tank voltage allows easy calculation of the receiver tank circuit quality factor (Q). The bias may be adjusted until a desired tank circuit quality factor (Q) is obtained, thus the tank circuit quality (Q) factor that is determined for a large signal is also the quality factor (Q) for a small signal due to the linear behavior of the tank circuit quality factor (Q) of the invention.

The Grindahl et al. reference teaches a radio frequency transponder having a super-regenerative receiver. The Grindahl et al. receiver uses an "external quench circuit 22 to . . . periodically turn off transistor 34, allowing the oscillations in tuned tank 32 to die out." Column 3, lines 31-33 of Grindahl et al. The external quench circuit 22 opens and closes the current return path in series with the source of transistor 34, thereby stopping amplification (oscillation) of transistor 34 whenever the source current path is open. Transistor 46 of the external quench circuit 22 turns on and off at a predetermined rate that is independent of received signal strength or modulation information. The transistor 34 must be turned off for a sufficient amount of time for the tank 32 oscillations to reach near zero for each quench cycle (a fixed time period). The amplitudes of the pulses presented to the detector 14 will be directly related to the amount of externally generated energy present in the tank 32. A detector 14 provides a rectified pulse amplitude modulated pulse train to demodulator 16. Demodulator 16 filters out the pulse frequency (constant, *e.g.*, one microsecond pulses every 22 milliseconds) to present only the modulated waveform to the logic module 18. Column 3, line 34 to column 4, line 14 of Grindahl et al.

The super-regenerative receiver operation taught in Grindahl et al. has no capability to quench the oscillations of the resonant tank circuit by loading the inductive coil thereof so as to stop the oscillations in a decaying manner, in contrast to Grindahl et al., which relies upon turning off the oscillator transistor (34) by preventing power supply current flow therethough. Also in contrast to what is being claimed for the present invention, Grindahl et al. cannot detect when a signal amplitude has reached a certain level in the resonant tank circuit so as to load the inductive coil of the tank circuit and thereby quench any potential oscillation thereof. Also Grindahl et al. can only use a fixed pulse train for arbitrarily turning on and off the

super-regeneration transistor 34, whereas the present invention has the ability to detect signal strength on the resonant tank circuit and adaptively quench, based upon signal strength, oscillations by loading the inductor coil of the tank circuit, *e.g.* quality factor (Q) loading with a resistor. In the present invention, the tank circuit is quality factor (Q) unloaded as soon as the oscillations decay to a certain level. Thus, the present invention is completely adaptive to the signal being received, and does not depend on a fixed-time external pulse train to quench the super-regenerative receiver oscillations.

The receiver taught in Grindahl et al. suffers from the same deficiencies as do other present technology super-regenerative receivers that use controlled quenching (fixed-time pulse train control) that introduces unwanted noise into the resonant tank circuit of the super-regenerative receiver, thus reducing the ultimate sensitivity of the super-regenerative receiver. In addition, the sensitivity of the Grindahl et al. type of super-regenerative receiver is non-linear due to the fixed-time controlled quenching.

In addition, implementation of a low frequency (LF) reception super-regenerative receiver is problematic when using the Grindahl et al. receiver design in that the quench control frequency and the carrier frequency are relatively close to one another when used for low frequency applications. This leads to difficulties in designing for reduced cross modulation (distortion), pulse train filtering and subsequent unwanted noise.

The Grindahl et al. regenerative receiver design drastically changes the bias level of the radio frequency (RF) oscillator transistor (turns it on and off) to obtain the quench action, this results in the effective quality factor (Q) of the tank circuit continuously changing, and that the quality factor (Q) is low during the critical startup phase of the tank circuit. A high quality

factor (Q) is desired at startup when "sampling" the incoming radio signal, because having a low quality factor (Q) results in the existing regenerative receivers being noisy since they receive wide bandwidth (low quality factor (Q) tank circuit) noise during startup. Another disadvantage of the Grindahl et al. regenerative receiver design is that with a varying bias, the effective receiver bandwidth quality factor (Q) changes with signal strength and thus noise performance can worsen during reception of weak signals.

The Alley et al. reference teaches a super-regenerative receiver having a QUENCH signal that controls oscillatory and non-oscillatory conditions. Column 3, lines 15-33 of Alley et al. The Alley et al. super-regenerative receiver operates in a similar fashion to how the Grindahl et al. super-regenerative receiver operates as described hereinabove. When the QUENCH signal is low, the tank circuit is allowed to oscillate and the tank circuit oscillation amplitude will build up. If radio frequency energy (RF) at the oscillation frequency is present (being received) then the oscillations will reach a certain magnitude in a relatively short period of time. If no RF energy signal is received, oscillations will still occur due to thermal noise but will build up to a certain magnitude in a relatively longer period of time. See Column 4, lines 20-67 and Figure 4 of Alley et al. Thus the comparator 58 is merely used in determining whether the oscillation amplitude is above or below a reference value at a certain time interval, *e.g.*, Δt_1 for a logic 1 detected, or Δt_2 for a logic 0 detected. See Figures 4 and 5 of Alley et al. The comparator 58 has no control of or capability to load or unload a resonant tank circuit quality factor (Q), as described and claimed in the instant application. The comparator 58 in combination with the timer function 60 merely determines whether a logic 1 (signal) or a logic 0 (no signal) is being detected. As can clearly be seen from the diagram of Figure 5 and accompanying description in Alley et al., there is no feedback control from the comparator 58 to

the super-regenerative circuit 20. Rather, the QUENCH control line that controls when the super-regenerative circuit is allowed to oscillate, also is used by the timer function 60 in determining whether a logic 1 or a logic 0 is being received at a certain time. The timer function 60 compares in the time domain, the signal from the comparator (OFF MDATA) and the QUENCH signal to see if a logic 1 (RF present) or a logic 0 (RF not present) is being received at a certain time as determined by the timing pulses from the QUENCH signal.

The references relied upon do not teach or suggest, individually or in combination, the limitations of "a quench circuit having a control input with first and second logic states, said quench circuit being coupled to the tuned circuit of said quenchable oscillator when the control input is in the first logic state, and said quench circuit being decoupled from the tuned circuit of said quenchable oscillator when the control input is in the second logic state; and a signal detection circuit, said signal detection circuit having an input coupled to the signal output of said quenchable oscillator and a control output coupled to the control input of said quench circuit, wherein if a signal level from the signal output is greater than a certain value then the control output of said signal detection circuit is at the first logic level and if the signal level from the signal output is equal to or less than the certain value then the control output of said signal detection circuit is at the second logic level," as recited in Claim 1.

Nor do the references relied upon teach or suggest, individually or in combination, the limitations of "providing a quench circuit for quenching oscillations of the quenchable oscillator; detecting a signal level from the quenchable oscillator wherein if the detected signal level is greater than a certain value then coupling the quench circuit to the tuned circuit of the quenchable oscillator, and if the detected signal level is less than or equal to the

certain value then decoupling the quench circuit from the tuned circuit of the quenchable oscillator," as recited in Claim 23.

Claims 2-11 and 14-18 depend from Claim 1 and contain all limitations thereof. Claims 25-27 depend from Claim 23 and contain all limitations thereof.

Claims 12, 21 and 29 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Grindahl et al. (U.S. Pat. No. 4,786,903) in view of Alley et al. (U. S. Pat. No. 6,487,264) as applied to Claims 1 and 23, and further in view of Midtgaard (U.S. Pub. No. 2002/0093389).

Applicants respectfully traverse the rejections and submit that the references relied upon do not teach or suggest, individually or in combination, what is being claimed in independent Claims 1 and 23, and all claims dependent thereto.

The Grindahl et al. and Alley et al. references have been discussed hereinabove for independent Claims 1 and 23. The Midtgaard reference teaches current generators used for frequency and gain control. The Midtgaard reference adds nothing further, expressly or inherently, to the other references relied upon regarding loading and unloading a resonant tank circuit of a super-regenerative receiver so as to stop oscillations of the tank circuit in a decaying manner.

The references relied upon do not teach or suggest, individually or in combination, the limitations of independent Claims 1 and 23 recited hereinabove.

Claims 12 and 21 depend from Claim 1 and contain all limitations thereof. Claim 29 depends from Claim 23 and contains all limitations thereof.

Claims 13, 19 and 24 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Grindahl et al. (U.S. Pat. No. 4,786,903) in view of Alley et al. (U. S. Pat. No. 6,487,264) as applied to Claims 1 and 23, and further in view of McEwan (U.S. Pat. No. 5,986,600).

Applicants respectfully traverse the rejections and submit that the references relied upon do not teach or suggest, individually or in combination, what is being claimed in independent Claims 1 and 23, and all claims dependent thereto.

The Grindahl et al., Alley et al. and Midtgaard references have been discussed hereinabove for independent Claims 1 and 23. The McEwan '600 reference teaches "quenching" an oscillator circuit by changing its voltage bias, see Figures 2 and 3. In the McEwan '600 reference, a pulsed radio frequency (RF) oscillator has a BIAS-ON path and a QUENCH path to produce fast turn-on and fast turn-off of RF bursts with well-controlled burst widths. Abstract of the McEwan '600 reference. The McEwan '600 reference does not teach or suggest quality factor (Q) quenching a resonant tank circuit that is controlled by a signal detection circuit based upon a signal having a certain value, as claimed in the instant patent application, and thus adds nothing, expressly or inherently, to the other references relied upon in rejecting the present claims.

Claims 13 and 19 depend from Claim 1 and contain all limitations thereof. Claim 24 depends from Claim 23 and contains all limitations thereof.

Claims 20, 22, 28 and 30 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Grindahl et al. (U.S. Pat. No. 4,786,903) in view of Alley et al. (U. S. Pat. No. 6,487,264) as applied to Claims 1 and 23, and further in view of McEwan (U.S. Pat. No. 5,630,216).

Applicants respectfully traverse the rejections and submit that the references relied upon do not teach or suggest, individually or in combination, what is being claimed in independent Claims 1 and 23, and all claims dependent thereto.

The Grindahl et al., Alley et al. and Midtgaard references have been discussed hereinabove for independent Claims 1 and 23. The McEwan '216 reference teaches "quenching" a regenerative transistor with an external quenching oscillator that supplies an exponentially decaying waveform for controlling the oscillations of the regenerative transistor, see Figure 1 of this reference. Abstract of the McEwan '216 reference. The regenerative transistor oscillator of the McEwan '216 reference uses an external quench control having predetermined waveform times similar to what was discussed hereinabove about the Grindahl et al., and Alley et al. references. Thus, the McEwan '216 reference does not teach or suggest quality factor (Q) quenching a resonant tank circuit that is controlled by a signal detection circuit based upon a signal having a certain value, as claimed in the instant patent application, and thus adds nothing, expressly or inherently, to the other references relied upon in rejecting the present claims.

Claims 20 and 22 depend from Claim 1 and contain all limitations thereof. Claims 28 and 30 depend from Claim 23 and contain all limitations thereof.

Applicants respectfully submit that in making a determination of obviousness, "the prior art as a whole must be considered. The teachings are to be viewed as they would have been viewed by one of ordinary skill." In re Hedges, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1986) (emphasis added). "It is impermissible within the framework of section 103 to

pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." Id. The present invention does not require a timed "quenching control signal as required by the references relied upon, nor is the lower frequency reception capabilities compromised as is the case in these references. Thus, the references relied upon teach away from what is being claimed.

No Waiver

All of Applicants' arguments and amendments are without prejudice or disclaimer. Additionally, Applicants have merely discussed example distinctions from the references relied upon. Other distinctions may exist, and Applicants reserve the right to discuss these additional distinctions in a later Response or on Appeal, if appropriate. By not responding to additional statements made by the Examiner, Applicants do not acquiesce to the Examiner's additional statements. The example distinctions discussed by Applicants are sufficient to overcome the rejections asserted in the present Office Action.

Applicants reserve the right to subsequently take up prosecution on the claims as originally filed in this or appropriate continuation, continuation-in-part and/or divisional applications.

Applicants respectfully request reconsideration in light of the remarks contained herein.

Applicants respectfully request withdrawal of all objections and rejections, and that there be an early notice of allowance.

SUMMARY

In light of the above amendments and remarks, Applicants respectfully submit that the application is now in condition for allowance and early notice of the same is earnestly solicited. Should the Examiner have any questions, comments or suggestions in furtherance of the prosecution of this application, the Examiner is invited to contact the attorney of record by telephone or facsimile.

Applicants believe that there are no fees due in association with the filing of this Response. However, should the Commissioner deem that any fees are due, including any fees for extensions of time, Applicants respectfully request that the Commissioner accept this as a Petition Therefor, and direct that any and all fees due are charged to Baker Botts L.L.P. **Deposit Account No. 02-0383, Order Number 068354.1365.**

Respectfully submitted,
BAKER BOTTS L.L.P. (023640)

By: Paul N. Katz

Paul N. Katz
Reg. No. 35,917
One Shell Plaza
910 Louisiana Street
Houston, Texas 77002-4995
Telephone: 713.229.1343
Facsimile: 713.229.7743
E-Mail: Paul.Katz@bakerbotts.com
ATTORNEY FOR APPLICANTS

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